Time: **2 Hours**   Date: **September 18, 2009**   Total Marks: **30**

Question 1 is compulsory and carries 10 marks. From the remaining attempt any four questions. Each of these carries 5 marks. Marks are shown to the left of each question.

Note: if answer of any question is compiler dependent, assume it is gcc compiler in Linux.

[2] 1(a). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
#define x 3+2
int main ()
{
int y;
y=x*x*x;
printf("%d",y);
return(0);
}
```

[2] 1(b). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
int main(){
int i=5,j=5,x,y;
x=++i * i++ ;
y=--j + j--;
printf("%d %d %d %d",x,y,i,j);
return (0);
}
```

[2] 1(c). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
int main(){
int i=5;
printf("%d",i<<2>>1);
return (0);
}
```

[2] 1(d). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
int main()
{
int i = 100, j = 200, *p=&i;
p = &j;
printf("%d %d",*p,*(&i));
return(0);
}
```

[2] 1(e). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
struct student
{
int rollnumber;
char name[25];
};
```

```c
int main()
{
struct student myself[]={{1,"Utsab"},{2,"Soumyashant"}, {3,"Sasthi"}};
printf(" %d   %d " ,(myself+1)->rollnumber,myself->rollnumber+1);
return(0);
}
```

[2] 2(a). What is pointer? How a two-dimensional array defined in terms of a pointer?

[3] 2(b). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
void assign1(int y)
{
 y = 5;
}

void assign2(int *y)
{
  *y = 7;
}

 int main()
{
int x=4,*p=&x;

assign1(x);
printf("%d\n",x);
assign2(p);
printf("%d\n",*p);
assign2(&x);
printf("%d\n",x);
return(0);
}
```

[3] 3(a). Explain the meaning of following three statements with reference to pointers:
        i)   int i = 100, *p = &i;
        ii) int x[ ] = {1,2}, *q = x;
        iii) int *a, *b = a;

[2] 3(b). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
int main()
{
int x[ ] ={10,20,30,40,50};
int *ptr = &x[2];
printf("\n %d   %d \n",*(ptr+1),*ptr);
return(0);
}
```

[2] 4(a). Distinguish between **break** and **continue** statements in C.

[3] 4(b). What will be the output of the following C program? Justify your answer.

```c
#include<stdio.h>
int main()
{
int i = 0, n = 0;
```

```
        while (i <= 6)
        {
            i++;
            if (i == 2)
                continue;
            n += i;
            printf("%d\n",n);
            if(n>=12)
                break;
        }
        return(0);
}
```

[2] 5(a). What will be the output of the following C program? Justify your answer.

```
#include<stdio.h>
int main()
{
int n;
for(n=1;n<5;n++)
switch (n%2)
{
    case 0 : printf("%d is an even number\n",n);
            break;
    case 1 : printf("%d is an odd number\n",n);
            break;
}
return(0);
}
```

[3] 5(b). Rewrite the above program using **if-else** statement instead of **switch** statement.

[2] 6(a). What are the differences between a **union** and a **structure** in C?

[3] 6(b). What will be the output of the following C program (assume that sizeof(int) and sizeof(double) are 4 and 8 bytes respectively)? Justify your answer.

```
#include<stdio.h>
union u1
{
int a;
double b;
};
struct v1
{
int c;
double d;
};
int main()
{
union u1 x1;
struct v1 y1;
struct v1 z1[5];

printf("%d\n",sizeof(x1));
printf("%d\n",sizeof(y1));
printf("%d\n",sizeof(z1));
return(0);
}
```

[5] 7. What is recursive function in C. Write a C program using **recursive function** to determine sum of all the elements in an integer array of size n.

Indian Statistical Institute
Midterm Examination 2009-2010
B.Math II Year I Semester
Computer Science I (Programming in C)

Part B (PRACTICAL)

Time: **2 Hours**   Date: **September 18, 2009**   Total Marks: **20**

Answer question 1 and any three from the rest. Each question carries 5 marks. Marks are shown to the left of each question.

Note: The programming assignments will be graded based on three components: 1) your code must be compilation error free and run, 2) your code must be commented upto certain extent, and 3) your code must be well-formatted and readable with self-descriptive variable names.

[5] 1.   Write a program in C that reads three integers a, b, and c and *rotates* the values stored so that value a goes to b, b to c and c to a. You should write a function using pointers and then call that function in the main() function of your program to perform the required rotation operation.

[5] 2.   Write a program in C that reads a positive integer X and do the following:-

(i) form an integer R by **reversing** the digits of X

(ii) compute S where S is the sum of digits of X

(For example, if X is equal to 1057, then R should be equal to 7501 and S should be 1+0+5+7=13)

[5] 3.   Write a program in C to find the *2's complement* of a given binary number.

(2's complement of a binary number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. For example, 2's complement of 11100 is 00100.)

[5] 4.   Write a program in C to store name, age and salary of 5 employees in an *array of structures* and then display name of all employees whose salaries are less than a given value.

[5] 5.   Assume that the file **matrix.txt** contains a 6×6 matrix of integers. Write a program in C that first reads the matrix from the file and then multiply the matrix by **itself**. You should write the multiplication result in a separate file **result.txt**.

[5] 6.   Write a program in C that takes a two-dimensional array ($N \times N$) of positive integers (integers are between 2 and 1000) as input and counts the total number of *distinct* primes in it. Your program should also display the list of all distinct primes.

Example:

Input:

3	50	3	500
60	19	200	6
90	100	29	7
8	71	37	29

Output: 6 (distinct primes are 3, 7, 19, 29, 37 and 71)